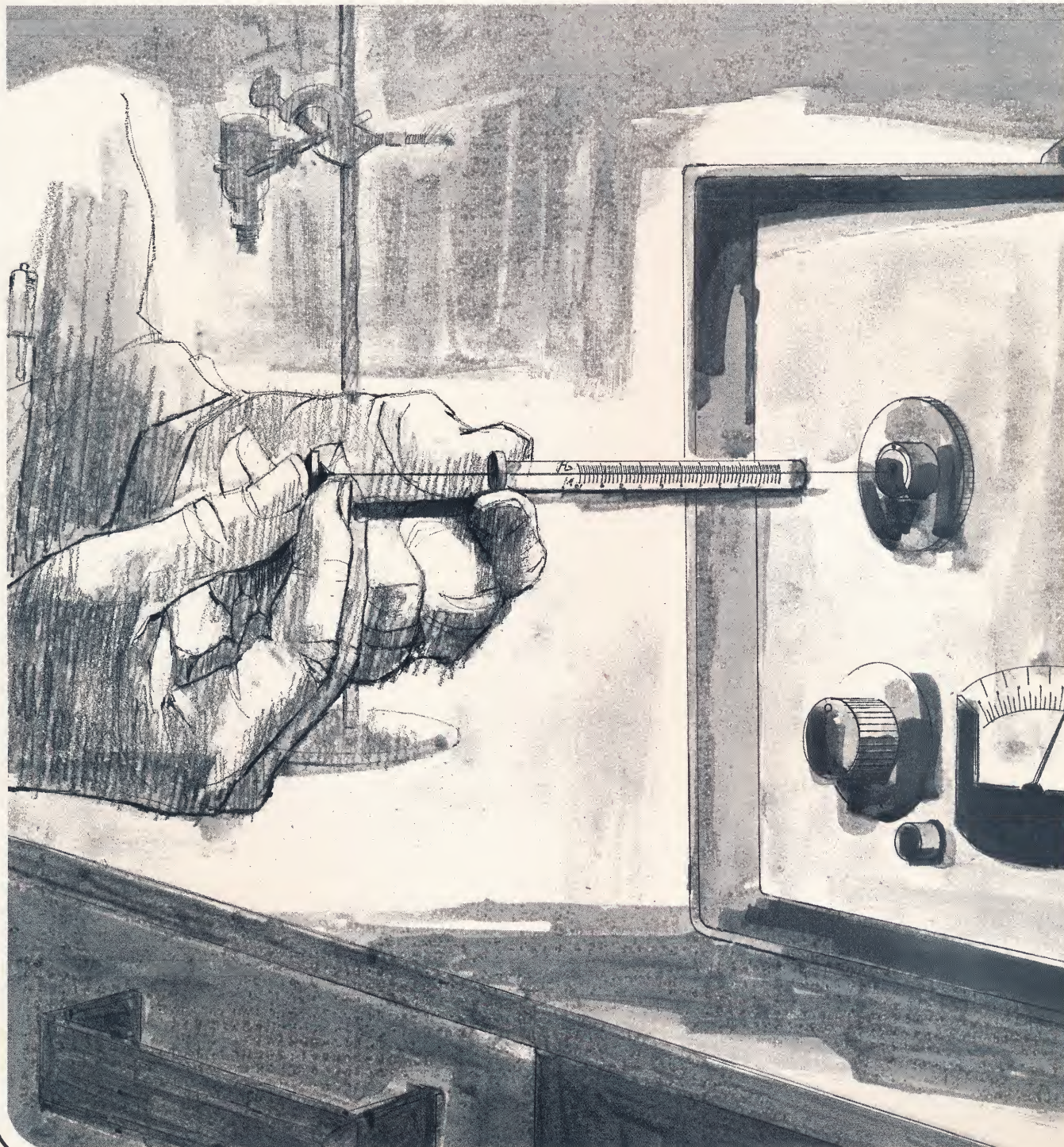


HAMILTON



PRECISION SYRINGES AND RELATED EQUIPMENT

Chromatography ■ Chemical and Medical Research ■ Industrial and Educational Laboratories



INTRODUCTION

If you are familiar with Hamilton products ... if you know the Hamilton instrument you need for your particular problem ... then the Table of Contents below may be all the direction you require. ■ If this is your first time through a Hamilton Catalog, perhaps a word of explanation would be helpful. We make syringes. Not commercial, mass-produced medical syringes, but precise measuring devices. They are used to inject minute samples in gas chromatography, for delicate medical injections, in treatment of small animals, and for a variety of similar projects in chemical and medical research laboratories. ■ You may also be interested in our special needles, our syringe innovations, our chromatograph accessories, or our miniature valves for essentially inert piping systems. These Hamilton products meet a multitude of special laboratory problems. ■ And if you don't find what you need among our standard products to solve your particular problem, don't be discouraged. We will be happy to help you find a solution. Through our Customer Service Department we have assisted many individuals over a troublesome hurdle by developing a special tool. To inquire about a special tool for your problem simply drop a note to the Customer Service Department outlining your problem and specifications. We'll be happy to let you know if we can help you, and to provide an estimate of costs. ■ Thank you for your interest in Hamilton products. If you have any questions not answered in the Catalog, please let us know. We look forward to being of service to you.

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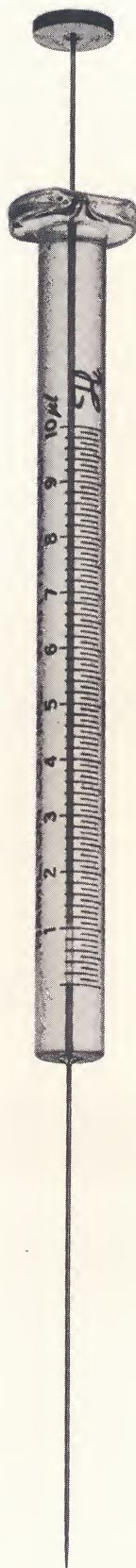
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THE HAMILTON MICROLITER[®] SYRINGE

MAYBE WE'RE FUSSY... but we believe you expect more than a handful of glass and stainless steel when you purchase a syringe...and when you order a Hamilton Microliter Syringe* you do get more! At Hamilton, we have only one product: Repeatable Precision. As users in the field have required finer and finer instruments to improve their standards for accuracy, we have improved our quality control and product facilities... Our goal is not to simply make merchandise to sell, but to perform a scientific service.

It would be easy to get into mass production. Instead, to give you the ultimate in quality, we rely on hand-craftsmanship, we burn the midnight oil dreaming up product improvements designed to your needs...re-designing precision adaptations to our already precise machines...and testing endlessly to assure you of a product accurate beyond question. Oddly enough, this very concentration on details has also shown us how to provide you with accurate measuring equipment at surprisingly low cost. Take a look at the extreme attention to details that makes a Hamilton Syringe an instrument of the greatest precision.

*Patent 2933087



BUTTON

Stainless steel staked on for permanence by staking machine.

PLUNGER

Stainless steel—straightened by precision machines and centerless ground to \pm twenty millionths of an inch roundness to assure accurate injection every time.

FLANGE

Integral with barrel—machine formed with flats to prevent rolling off table.

BARREL

Syringes are of N51A alkali resistant glass; annealed after forming to relieve internal strains.

BORE

Fine, accurate bore is achieved by machine-shrinking glass around precision-ground mandrel. For uniform action all the way, bore is pre-honed to a maximum error of 30 millionths clearance in taper and roundness then mated to its individual plunger by patient hand lapping.

GRADUATIONS

Permanent accuracy is achieved by an ionic reaction of silver nitrate stain and a glass barrel. Hamilton markings are permanent.

CEMENTING

Careful application of epoxy by capillary attraction secures fixed needle leak-tight.

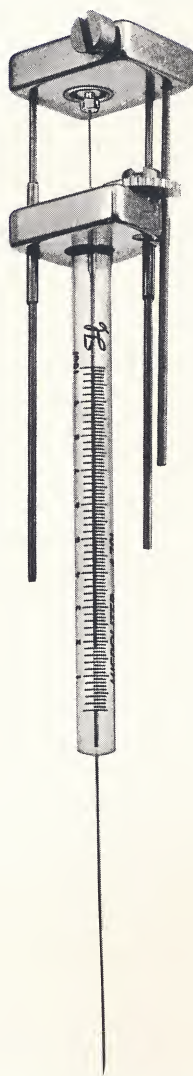
NEEDLE

701N of 26-gauge stainless steel, 2" long, specially drawn to .0045" I.D., but on request to .010" I.D. for viscous fluids. All other syringe needles of 22-gauge, especially drawn to .006" I.D., with electrolytically tapered point.

POINT

Electrolytically tapered at tip, then ground and polished to super sharpness for easy septum penetration.

MICROLITER[®] SYRINGES*



701 NCH



701 NW/G



701 LT

THE 700 SERIES—Hamilton Microliter Syringes of the 700 Series have become the standard measuring instrument in laboratories throughout the world. The 700 Series won this honored place by an absolute liquid delivery accurate within 1% and by a repeatable accuracy within 1%. These accuracies are achieved by tight dimensional tolerances adding to less than 1% volume variation, and a clear, clean scale giving a reading error of less than 1%. All 700 Series syringes are available either with a fixed needle,

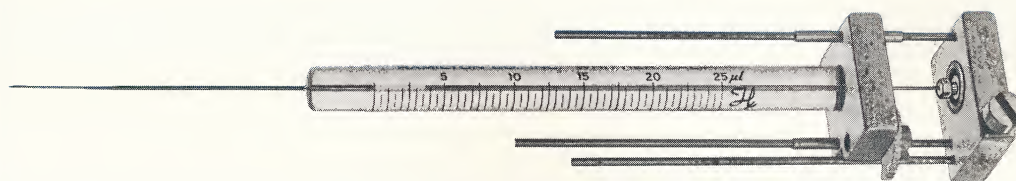
or with an American Standard luer tip.

FIXED NEEDLES—Fixed needles are epoxy-cemented concentrically to the syringe bore and to the “zero” on the syringe calibration. The 701 through 750 have a new termination for syringes with cemented needles designed to replace the luer and reduce syringe breakage.

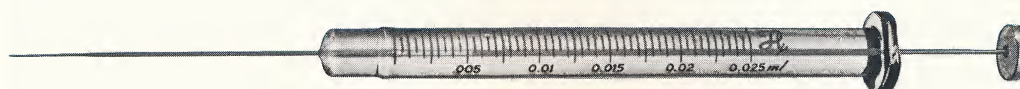
A luer tip with needle (N/LT) is available when specified. 701N supplied with a special 26 gauge,

microliter[®] syringes cont.

702 NCH



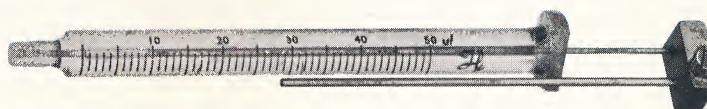
702 N



705 N



705 LTCH



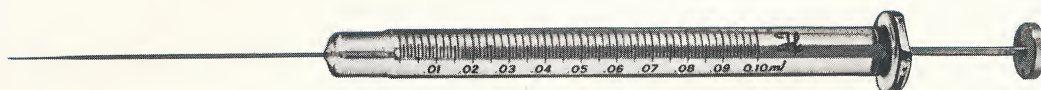
2" needle, specially drawn to .0045" I.D. for fluid materials unless otherwise specified. (A 26 gauge, .010" I.D., is recommended for viscous materials; specify if desired.) When other 700 Series syringes are ordered with fixed needles (N) they will be supplied with a 2" specially drawn 22 gauge (.029" O.D. x .006" I.D.) needle, electrolytically tapered to .014" at the point. Other needle styles, gauges, and lengths available to 1 ft. at no additional cost.

KEL-F-GUIDE — A guide (see model 701 NW/G) is available for all 700 and 7000 series that supports the plunger and maintains alignment. It is made of Kel-F, with stainless steel guide rods.

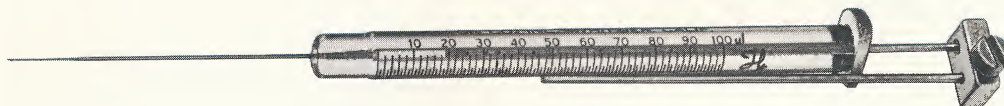
TESTING — Each 700 Series syringe is subjected to a leakage test using acetone under 5 atmospheres pressure. Any syringe that exceeds a leak rate of 1/10th of total syringe

microliter[®] syringes cont.

710 N



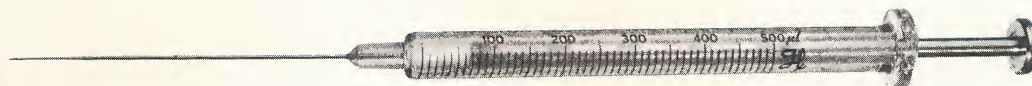
710 NCH



725 NCH



750 LTN



6

volume in 12 seconds is rejected. This is your assurance of lasting, accurate performance.

†NOTE: The 701 and 702, which were formerly available with fixed needle only, are now available with an American Standard luer tip. Since the volume of these syringes is too small to permit filling with a normal hypodermic needle attached, the luer tip option is available as a convenience in assembling the syringe to other equipment. For normal use and ease of filling, we recommend the 701 and 702 with fixed needles.

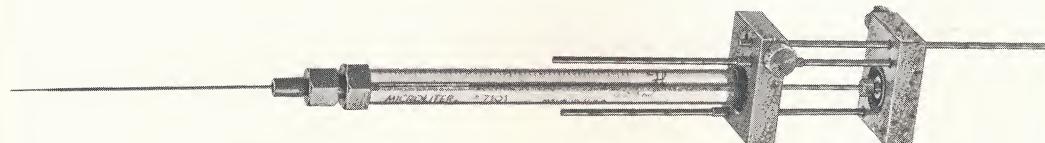
7000 SERIES	CAPACITY	
	µl	ml
7101 N	1.0	0.0010
7001 N	1.0	0.0010
7005 N	5.0	0.0050

700 SERIES	CAPACITY	
	µl	ml
701 †	10.0	0.010
702 †	25.0	0.025
705	50.0	0.050
710	100.0	0.100
725	250.0	0.250
750	500.0	0.500

NEW
7101 N



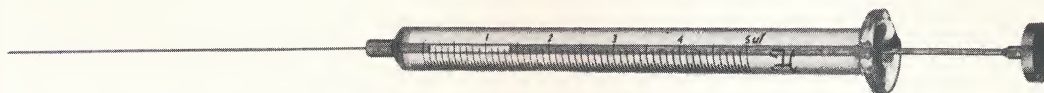
NEW
7101 NCH



7001 N



7005 N



THE 7000 SERIES†—Hamilton's 7000 syringes were developed to provide the analyst with devices for delivering liquid samples of less than 1.0 µl to a gas chromatograph with the very highest reproducibility and accuracy. The needle holds the entire sample! A tungsten wire plunger is individually fitted to the .006 inch bore of the stainless steel needle and bottoms at the tip of the needle to discharge the entire sample, essentially eliminating end effects.

A Teflon* ferrule, contained in the hex-shaped hub of the 7101N, makes a final seal around the plunger at the base of the needle. It is easily tightened to compensate for wear. The needle

and plunger may be disassembled for cleaning or replacement. (Write for field repair instructions and replacement parts list on 7101N.)

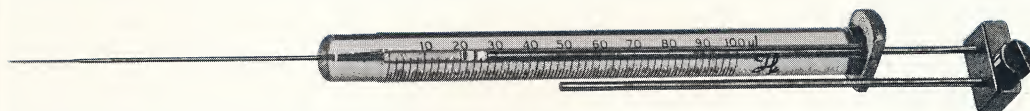
A plunger travel of 5.5 cm on the 7101N delivers 1.0 µl, and a competent worker can inject 0.5 µl to 1.0 µl liquid samples into a gas chromatograph with a reproducibility of $\pm 1\%$...and samples down to 0.05 µl at $\pm 2\%$. Delivery accuracy is $\pm 2\%$ of 1.0 µl. Graduations are .01 µl. Every 7101N is tested by injecting samples into a gas chromatograph to assure quality performance.

†Patent 3101084

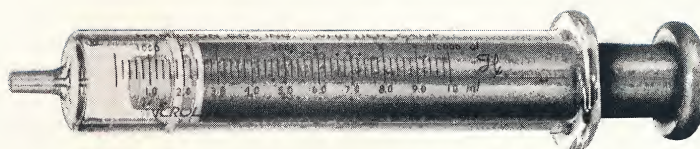
*duPont registered trademark

GAS TIGHT SYRINGES*

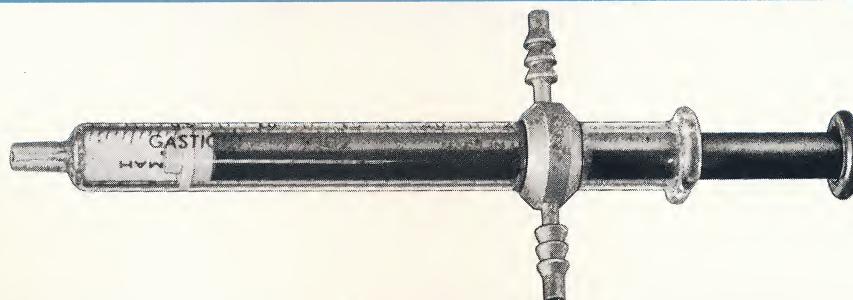
1710 NCH



1010



NEW
GF 1002



Hamilton Gas Tight Syringes provide exacting reproducibility in handling gas... with no leakage at pressures up to seven atmospheres and a leak rate less than 3 μ l per hour under partial vacuum. You can depend on them for precision measurements in gas chromatography and allied fields... and in the pipetting of corrosive, highly colored liquids, or liquids which normally cement the plunger to the barrel.

FEATURES

Stainless steel plunger, coated with corrosion resistant Teflon resin (Tetrafluoroethylene Polymer-DuPont)—except 1705 and 1710 which have tungsten plungers.

Available with needles as described in 700 Series.

Available with Chaney Adaptor—setable to give reproducible results to $\pm 1\%$.

Plungers are interchangeable, but may not index to zero.

Teflon tip provides smooth, firm, spill-proof plunger movement.

Gas Flush Modification—This syringe attachment is gas tight along entire working length. It permits complete flushing of syringe and needle with the bottled sampling gas—under fume hood if gas is dangerous. Available for all sizes and models of Hamilton gas tight syringes. To order, place "GF" before syringe model number.

MODELS AND SIZES

MODEL	CAPACITY
	ml or cc
1705	0.05
1710	0.10
1725	0.25
1750	0.50
1001	1.00
1002	2.50
1005	5.00
1010	10.00
1020LL	20.00
1030LL	30.00
1050LL	50.00

NOTE: 1020, 1030, and 1050 available with Luer Lock only.

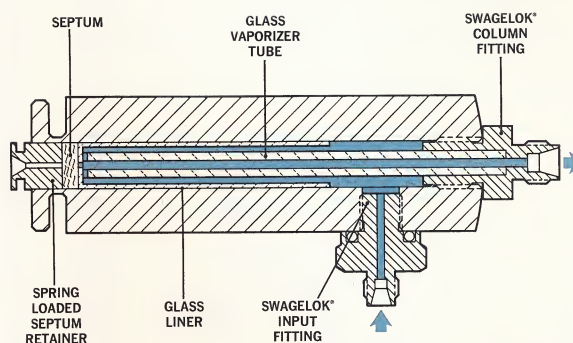
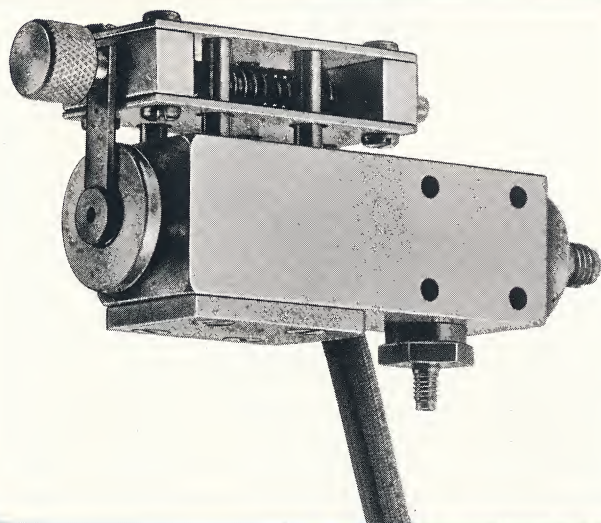
* U. S. Patent 3150801 G. B. Patent 960294

INLET

86800

NEW

CROSS SECTION



INLET—Hamilton's Inlet essentially eliminates the undesirable band spreading which occurs in the inlet of most gas chromatographs. This is accomplished through superior flow geometry, judicious choice of relative gas velocities, and by maintaining a small uniform cross sectional area in the sample gas passage.

Hamilton's development work on flow geometry produced the concentric tube arrangement shown in the schematic line drawing above. A high velocity, pre-heated gas stream continuously washes the septum area and restricts flashback. The flow passes cleanly to the column through a 1 mm I.D. glass vaporizer tube without band spreading voids. (An alternate tube of 2.5 mm I.D. is available. Either tube may be packed for on-column injection.)

The Inlet's heavy aluminum outer body evenly distributes the heat from the cartridge heater and eliminates cold spots.

A unique spring loaded retainer facilitates rapid septum replacement and allows easy access to the inner parts for replacement or cleaning. This is helpful when analyzing samples which leave a residue.

Inert glass is used on the sample-contacting parts to protect sensitive compounds from metal surface decomposition. The glass vaporizer tube

may be packed with column material for on-column injection or pre-column chemistry.

During injection, the needle is guided by the retainer without hang-up. The constant force of the spring assures that the septum seals instantly as the needle is withdrawn, preventing blow-back of the sample. This feature substantially improves quantitative injection.

The limits of 325° C. and 40 psig at the septum means that the Hamilton Inlet will handle almost any application. It is available for use with $\frac{1}{16}$, $\frac{1}{8}$, $\frac{3}{16}$, or $\frac{1}{4}$ inch O.D. columns. Substitution of a Teflon® ferrule in the Swagelok® fitting permits easy connection to glass columns.

Inlet is supplied complete, except for a column connector; for sizes and prices of connectors, refer to Page 22. Accessories supplied with the Inlet include a package of 12 Hamilton septums, an extra glass cap, and an extra glass vaporizer tube.

SAMPLING ACCESSORIES

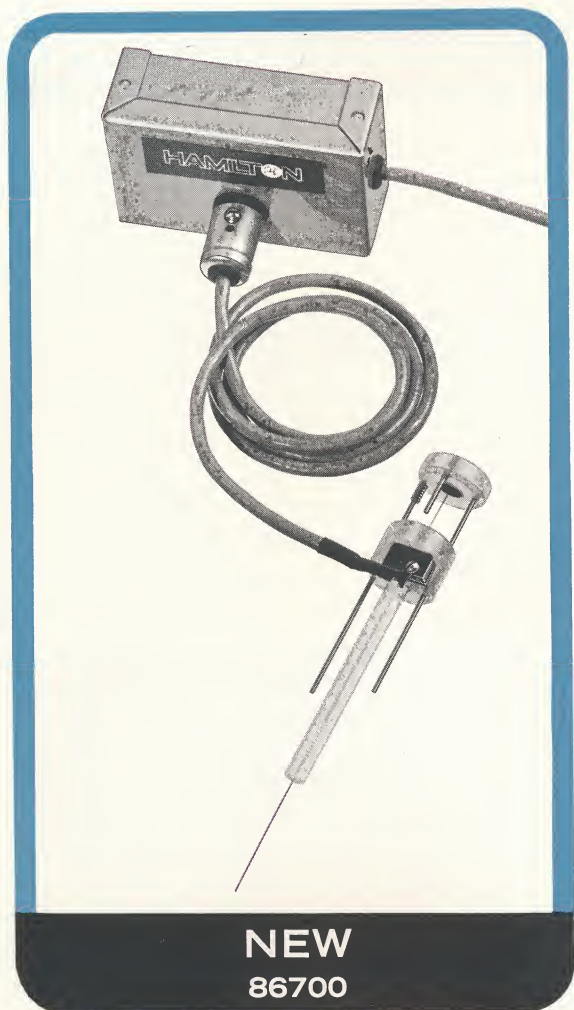
The following sampling accessories for the Hamilton Inlet are available or under development:

- Pyrolysis sampler
- Biopsy needle sampler
- Solid sampler

Write for further details.

CHROMATOGRAPH ACCESSORIES

10



NEW
86700

86700 INJECTION TIME MARKER

Now you can produce a mark on your chromatogram indicating the time of your injection. The 86700 is a two-unit system; an adaptor unit, and a switch unit. The adaptor unit connects to the recorder in parallel with the attenuator output. It will not load the attenuator or detector since it presents an open circuit after producing the mark. The switch unit, which also serves as a plunger guide, mounts on the syringe and plugs into the adaptor. 86700 for 701 series syringe. 86705 for 700 and 7000 series syringes; 86701 adaptor unit, for 1 mv recorders, produces 0.1 mv signal with 4.7 ohm internal impedance.

870 FRACTION COLLECTOR

The Hamilton Fraction Collector isolates samples on ultra pure silica sand chilled to liquid nitrogen temperatures in low cost borosilicate U tubes. Individual tubes have no stopcocks to



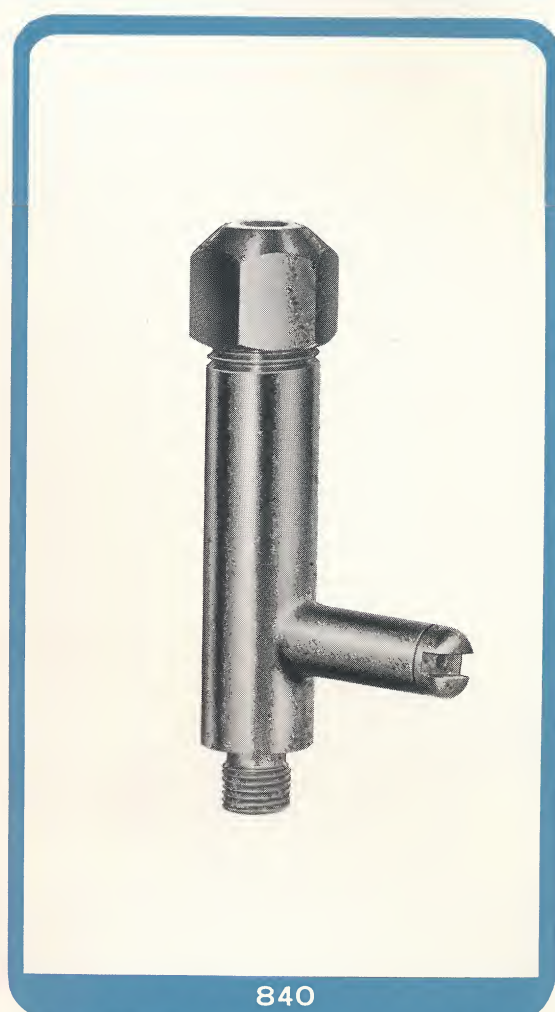
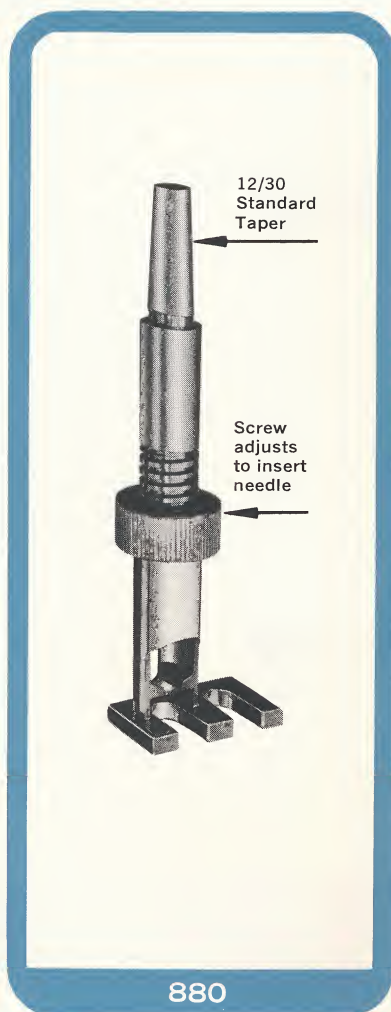
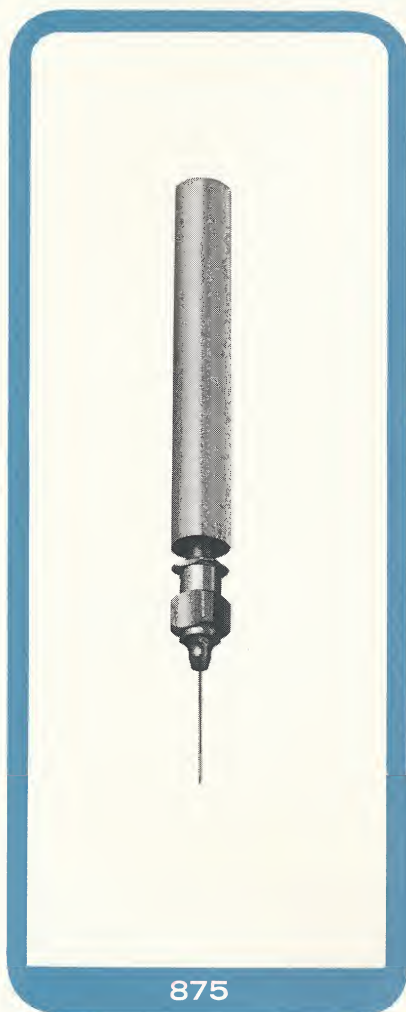
870H disassembled

leak, no grease to absorb small fractions. They provide a vacuum-tight seal with a rubber stopper and are simple to clean. All metal parts in sample path are stainless steel. Thus, you'll find it easy to remove the carrier gas and submit the uncontaminated fraction in the U tube directly to your mass spectrometer laboratory. The sample is trapped in the U tube by penetration of the rubber U tube closures with two $\frac{5}{8}$ " N726 needles on the inlet-outlet lines.

Since a four-position turntable permits removal of U tubes and insertion of empty tubes while collecting samples, you can isolate any number of fractions from a single chromatograph run.

Additional time and money saving features are Hamilton's rapid one-stroke operation and ease of mounting the fraction collector on your chromatograph.

chromatograph accessories cont.



875 VACUUM PROBE

This is an efficient tool for getting the majority of the carrier gas out of the U tube...or for evacuating any container with a rubber closure. It is constructed from one piece of stainless steel, 2½" long, with luer accurately turned to mate with American Standard hypodermic needles.

880 ADMISSION PROBE

Serves as both holder and control for admitting samples from U tube into a mass spectrograph. The U tube stopper plugs the enterant needles so the assembly may be evacuated. Advancing the needle through the stopper admits the fraction sample to the spectrograph. All parts that contact the gases to be analyzed are of 300 series stainless steel.

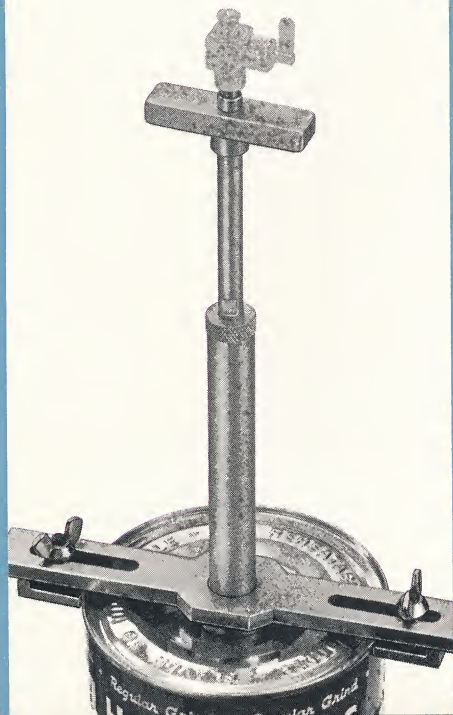
840 LECTURE BOTTLE SEPTUM

This design similar to a chromatograph septum permits sampling of lecture bottles and other high pressure vessels. The lecture bottle thread is a 5/16-32 UNEF. Other thread terminations are available on special order to ½" diameter or ⅛" NPS pipe thread at no additional charge.

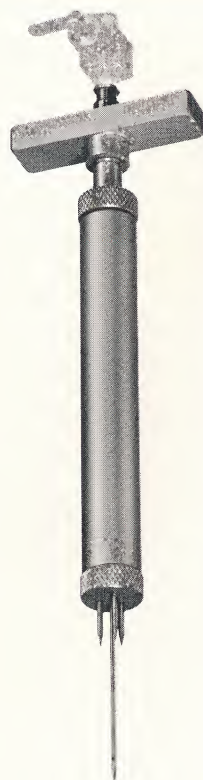
The side arm has a ball check pressure valve so that tubing may be connected. It may be connected to a bubble flow meter or to a reaction flask.

SYRINGE INNOVATIONS

12



NEW
87102



NEW
87103



NEW
87205

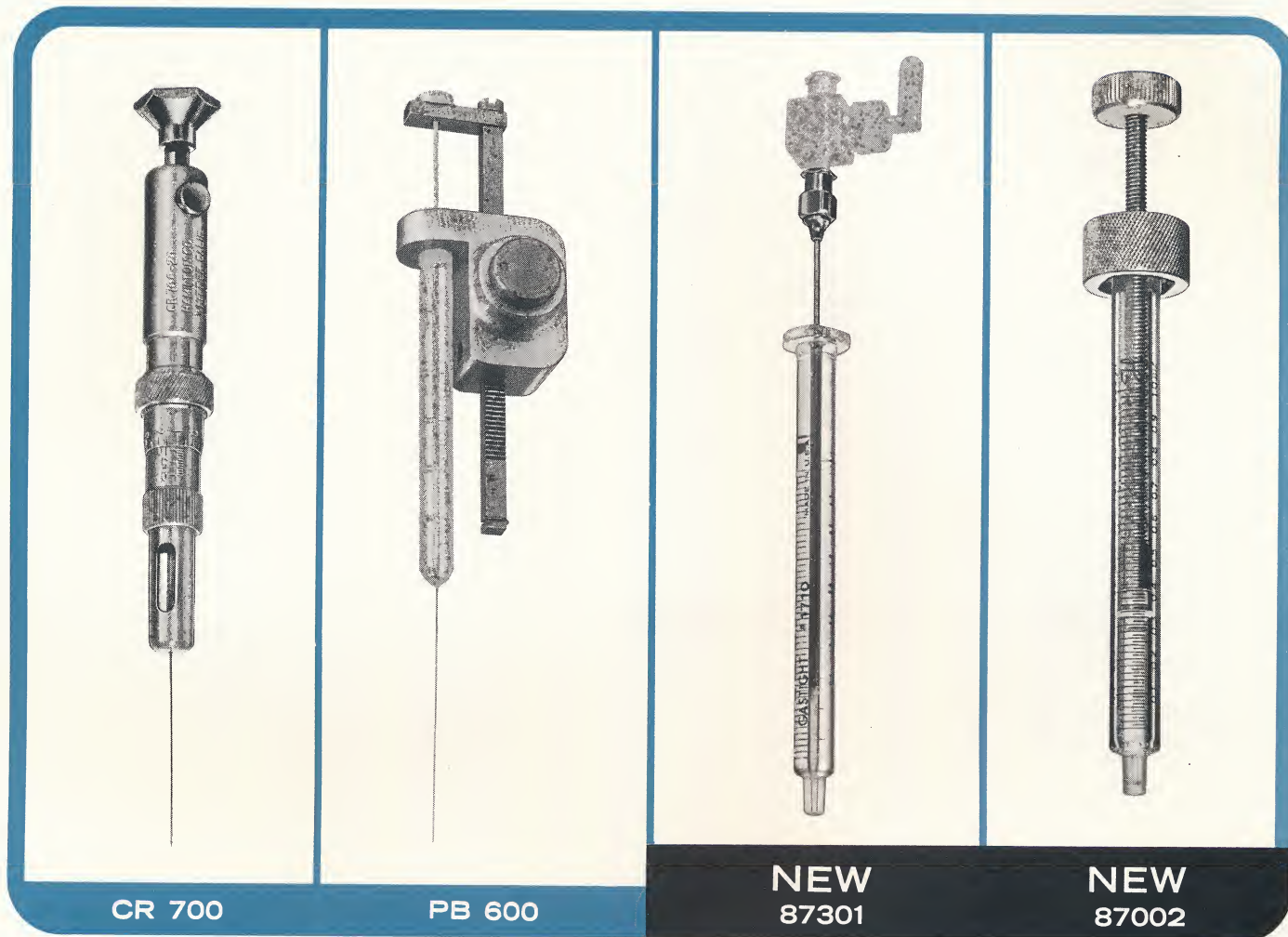
87100 Head-Space Samplers — These rugged devices are used to sample the head-space gases in cans, bottles, and similar containers. After the device is fixed to the container, the needle can be inserted into the head-space by penetrating the tin plate or cork. An adjustable stop-collar sets the depth of needle penetration. A sample of the uncontaminated gases may then be obtained through a valve. 87103 is the corked-bottle sampler; 87102 is the can sampler; 87101 is the capped-bottle sampler. Replacement needles and additional penetrating ends are available; refer to Page 23.

87200 Syringe Mantle — Here's a way to keep the sample in your syringe at a constant temperature... from 0° C to 100° C. Ideal for

low boiling hydrocarbons, viscous materials, or low melting samples. A hot or cold liquid is circulated through the glass jacket surrounding the syringe, thereby maintaining the sample temperature. Removable glass jacket fits Hamilton gas tight syringes from 1705 to 1010. Kept leak-proof by means of Buna-N "O" ring.

CR 700 Syringe* — Delivers like quantities of similar liquids in like times—at the push of a button. The volume is adjustable in one microliter units. Repeatable and resettable accuracy $\pm 1\%$. Spring driven, fast, accurate and easy to use and repair. Permits different operators to accurately inject identical quantities. Available in CR 700-200 (10 to 200 μl usable capacity), or CR 700-20 (1 to 20 μl usable capacity).

*Patent applied for.



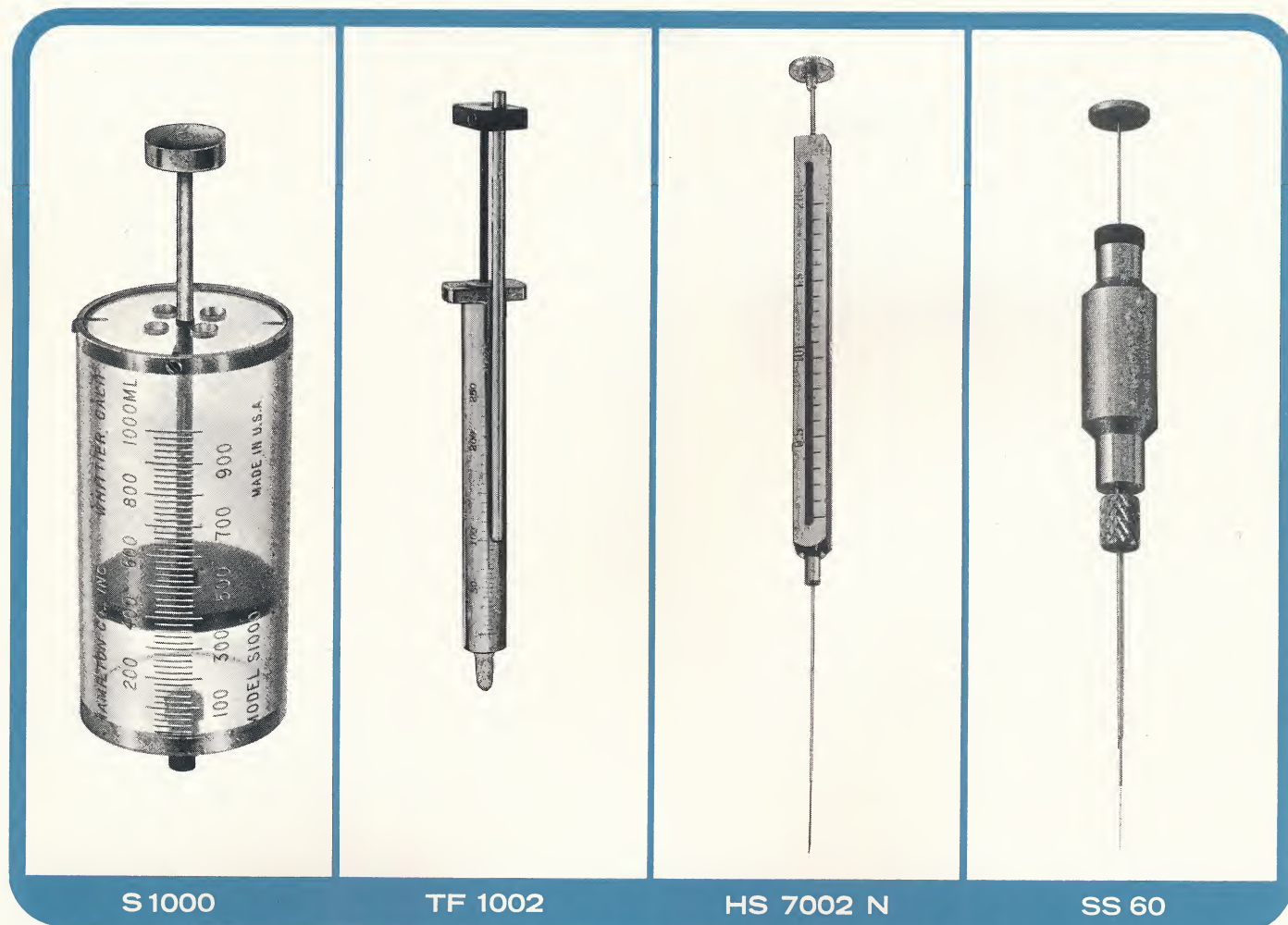
PB 600 Repeating Dispenser* — This device will discharge 1/50th of the syringe capacity at each push of the button. It is particularly useful for thin layer chromatography, droplet placement, preparation of standard reagents, and uniform injections. PB600-1 fits all Hamilton syringes from 702 (25 μ l) through 1002 (2.5 ml) capacity. PB600-10 available for larger syringes, 1005 (5 cc) and 1010 (10 cc).

87300 Back-Fill Syringe — The hollow-plunger permits a gas tight syringe to be filled from the rear, eliminating the dead volume in the needle hub. Valves or larger syringes may be attached to the button end of the hollow plunger by means of a standard needle hub. This proce-

dure affords bubble-free filling and eliminates normal pumping action. For model numbers, capacities, and prices on the Back-Fill Syringe, refer to page 22.

87000 Threaded Plunger Syringe — With this unique device you can deliver a constant volume by moving the plunger forward with a screw-drive action. It will deliver a given volume over a given time period when attached to a drive motor. The 87000 offers a positive means of delivering viscous and other heavy materials. The 87000 unit is twist-locked onto the syringe, providing quick disconnect and easy filling by normal pumping action. Available with a gas-tight Teflon tip in 0.5 ml, 1.0 ml, and 2.5 ml capacities.

*Patent applied for.



Super Syringes—Here's a convenient, simple, and accurate method for delivering known volumes of gas. Ideal for air and gas sampling, calibration of reservoirs and pneumographs, and various phases of anesthesiology. Cylinder of acrylic resin, Teflon coated aluminum piston, Buna-N "O" ring seal. S0500—0.5 liter capacity, S1000—1.0 liter, S1500—1.5 liter.

TF Series Teflon Syringe—Designed for measuring and transferring exceedingly reactive chemicals. Only Teflon comes in contact with the chemical contents. Rigid metal case protects Teflon syringe...will not break or crack if dropped. (See price list for sizes from 250 μ l to 10 ml.) Available with or without needle.

HS 7002 N All-Metal Syringe—Primarily a "hot" syringe for injecting melts of viscous or tarry samples. Heat sample and syringe in oven, fill and inject. Also gives excellent performance as a "cold" syringe. Shield with aluminum foil, fill, and inject. Available in 2 μ l capacity only.

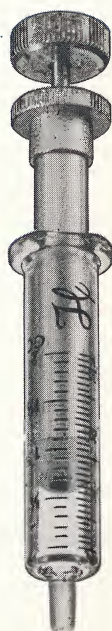
SS 60 Solid Sampler†—Hamilton's approach to solid sampling is very similar to operating a syringe through your chromatograph septum. The dissolved or melted sample is placed onto the sample tongue of the plunger. Then withdraw the plunger into the septum penetrating needle. Now insert the needle into the septum and depress the plunger. Easy to operate and clean. May be loaded by 7001N or 701N syringe. Constructed with .028 OD needle, .019 OD plunger.

† Patent 3,104,084

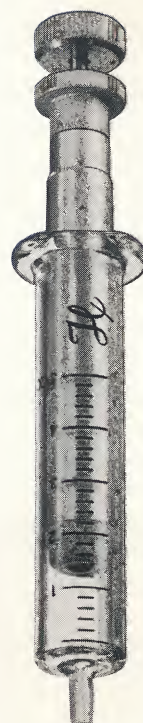
MICROSYRINGE PIPET CONTROLS*



0010



0020



0030

Smooth dual control of the meniscus with Hamilton Pipet Controls makes pipetting rapid and precise. First, the liquid meniscus is raised almost to the pipet calibration line by means of the free sliding plunger. Then thumb-wheel (screw) control brings it accurately to the scribed line of the pipet. They adapt very readily as the drive for a calibrated pipet, making an accurate system for micro-titrations.

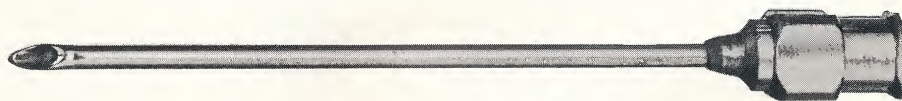
MODELS AND SIZES

MODEL	CAPACITY—ml or cc
0010	1.0
0020	2.0
0030	5.0

*Patent 2561273

NEEDLES

**STAINLESS
STEEL
NEEDLE**
STANDARD HUB



**STAINLESS
STEEL
NEEDLE**
STANDARD HUB
Electrolytically
Tapered Point



**STAINLESS
STEEL
NEEDLE**
KEL-F HUB



**STAINLESS
STEEL
NEEDLE**
KEL-F HUB
Electrolytically
Tapered Point



TEFLON NEEDLE KEL-F HUB

needles, cont.

STAINLESS STEEL NEEDLES STANDARD HUB

Hamilton manufactures a wide range of 304 stainless steel needles with American Standard luer hubs. They are available in any of the four point styles illustrated below, in any gauge from 37 to 10, and to any length up to 8 feet. All may be autoclaved; shipped clean but unsterilized. **They are also available with an electrolytically tapered point**, where the last portion of the needle is tapered to a finer diameter. (Specify if desired.)

STAINLESS STEEL NEEDLES KEL-F* HUB

The Kel-F Hub creates a firm joint that tests leak-tight at 7 atmospheres. 50 μ l and 100 μ l syringes may be used successfully with these needles (less than 22 gauge) and can be filled bubble-free by several strokes of the plunger. The hubs have low dead volume. Also available with electrolytically tapered point. (Specify if desired.)

* 3M Registered Trademark

TEFLON† NEEDLES KEL-F* HUB

The essentially inert Teflon needles and Kel-F hubs eliminate the risk of contamination when syringe-pipetting highly corrosive materials. The

flexible tubing is advantageous for hard to reach areas. Needle available in sizes approximating standard needle gauges of 8 to 22, in lengths from 1 inch to 100 feet. Leak tight for liquid or gas to 100 psi. Available in Point Style 3 only.

† duPont Registered Trademark

SQUARE TIP NEEDLE RECOMMENDED FOR GAS CHROMATOGRAPHY

Exhaustive testing by the Hamilton Research and Development Department clearly indicates that the electrolytically tapered square tip needle is far superior for use in gas chromatography. Reduced cutting of the septum takes place with the square tip needle. The needle slips through easily, giving an extended, leak-free septum life — up to 10 times longer than with standard 17° or 22° point styles. This feature is especially important, since Hamilton has concluded that minute septum leaks probably account for a large proportion of the non-reproducible sampling that occurs.

17



16801 LUER CAP

This solid Kel-F hub, without the hole for the needle, is handy for such chores as capping a syringe.

NEEDLE POINT STYLES



POINT STYLE 1
17° bent for septum
penetration



POINT STYLE 2
22° bent for
general use

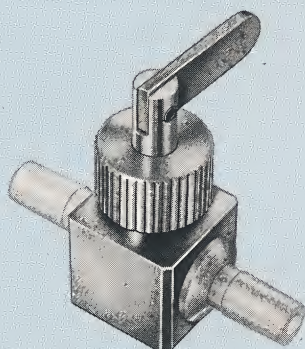


POINT STYLE 3
90° recommended
for chromatography



POINT STYLE 4
12° standard medical
point

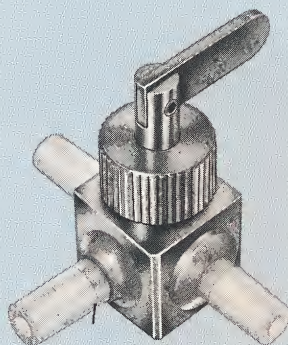
VALVES*



#2 Two-Way Hamilton Valve

For simple on-off control of straight-through flow. Choice of male and/or female luer connectors; other fittings optional at extra cost. Standard port size: .076". Overall: $\frac{7}{16}$ " wide x 1" high x $1\frac{1}{16}$ " long. Weight: under 1 ounce.

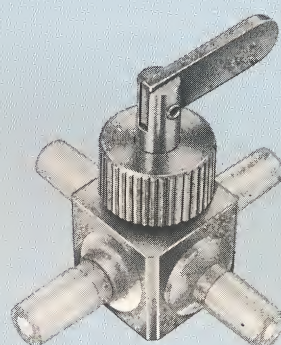
\$16.00



#3 Three-Way Hamilton Valve

Porting arrangements allow flow through any two adjacent ports or through all three at once. Choice of male and/or female luer connectors. Other fittings optional at extra cost. Standard port size: .076". Overall: $\frac{7}{8}$ " wide x 1" high x $1\frac{3}{16}$ " long. Weight: under 1 ounce.

\$21.00



#4 Four-Way Hamilton Valve

Porting arrangements allow flow through any two adjacent ports, any three adjacent ports, or any two pairs of adjacent ports. Choice of male and/or female luer connectors. Other fittings optional at extra cost. Overall: $1\frac{1}{16}$ " wide x 1" high x $1\frac{3}{16}$ " long. Weight: under 1 ounce.

\$25.00

With the new Hamilton Valves and Accessories, you can build the piping system you need for control of corrosive gases and liquids... in miniature... without reaction and without loss of gas or liquid.

This versatile group of Teflon* and Kel-F† equipment includes every element necessary for a complete system. You can quickly alter or expand your flow set-up through multiple variations. You can connect and disconnect the standard luer fittings at a touch — without wrenches or lubricant — and save untold hours when changes are required. The compact size and less-than-one-ounce weight of a Hamilton Valve not only saves bench and storage space, but allows a whole system to be free standing. To the best of our knowledge, this is the greatest variety of portable, miniature, inert valving equipment available.

*Patent pending

The Hamilton Valves and Accessories fill the needs of most laboratories and instrument manufacturers for a small volume, gas-tight, inert valving system, capable of endless rearrangements. The ported plugs are precision-machined from self-lubricating solid Teflon* ... other wetted parts from Kel-F†. They assure essential inertness, and leakproof operation over an operating range of -10°C to $+100^{\circ}\text{C}$. A sturdy metal body protects the working parts.

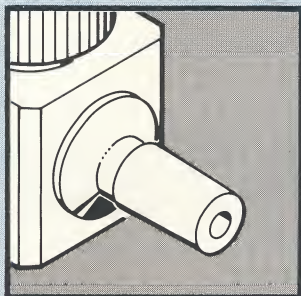
As a part of Quality Assurance, every Hamilton Valve is tested leak-tight... to 100 psi at ambient temperature. Fingertip adjustment of the packing nut provides a positive seal. All items are stocked for immediate delivery from the factory and may be ordered direct or through your authorized Hamilton Dealer. The valves, connectors, and tubing are all autoclavable.

*DuPont Registered Trademark

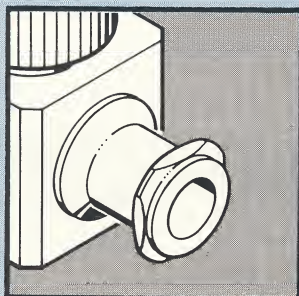
†3M Registered Trademark

Valve Options and Accessories

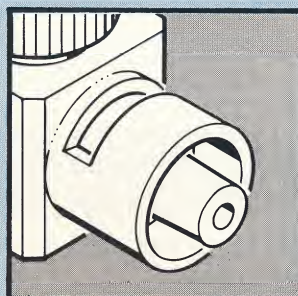
FITTINGS (Gas tight when used with other Hamilton Valve components)



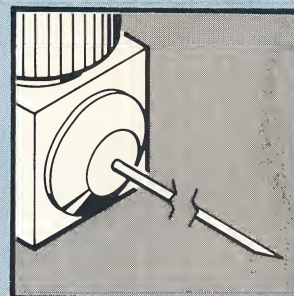
M—MALE. Standard male luer taper, as on all American-made syringes. Allows finger-tight, gas-tight connection and quick disconnect. Kel-F†. No charge.



F—FEMALE. Standard female luer hub, same as on all American-made hypodermic needle hubs. Creates gas-tight seal with Hamilton Valve components. Kel-F†. No charge.



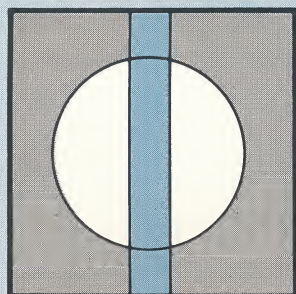
L—MALE WITH LUER LOCK. Metal locking device connects to female hub with twist. Assures positive seal...no drift or accidental disconnect. \$3.00



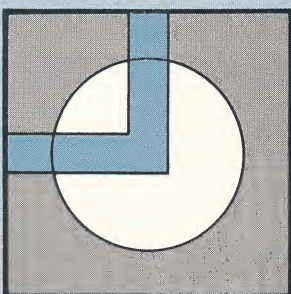
N—NEEDLE. 2" stainless steel needle with tapered tip and 22° general purpose point. 22 gauge. Other gauges, point styles, and lengths available on request. \$1.75.

T—TUBING. 2" annealed stainless, 1/16" and 1/8" O.D., \$1.75.

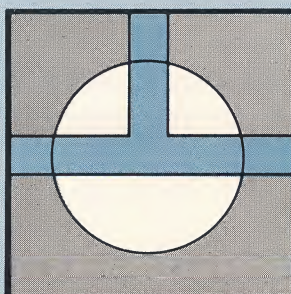
PORTING



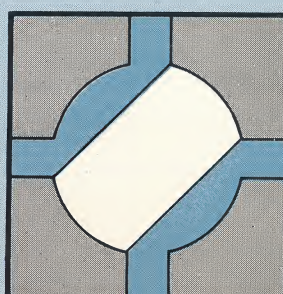
#1—180° TWO-WAY. Straight-through flow, used in standard two-way Valve for instant on-off control. Teflon* plug.



#2—90° TWO-WAY. Right angle port allows flow through any two adjacent 90° ports in three-way or four-way Valve. Teflon* plug.



#3—"T" PORT. Allows flow through three adjacent ports in three-way or four-way Valve. Teflon* plug.



#4—FOUR-WAY PORT. Allows simultaneous flow through any two pairs of adjacent ports in four-way Valve only. Teflon* plug.

CONNECTORS AND TUBING



MM—Male & Male
\$2.50



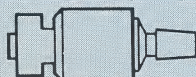
FF—Female & Female
\$2.50



MF—Male & Female
\$2.50



LL—Luer Lock & Luer Lock
\$8.50

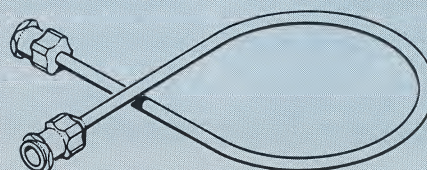


LM—Luer Lock & Male
\$6.50



LF—Luer Lock & Female
\$6.50

CONNECTORS (Gas tight when used with other Hamilton Valve components). Connectors for Hamilton Valve tubing are available in six configurations — all precision-made from durable inert Kel-F†. All have standard luer taper for tight sealing against vacuum, or gas and liquid pressure.



TUBING Inert Teflon* tubing with .076" I.D. (other sizes available), supplied with Kel-F† Female luer fitting both ends. Standard increment one foot; also available on special order to any desired length less than 100 feet. \$5.00 first foot, \$1.00 each additional foot.

HOW TO ORDER:

Hamilton Valves and Accessories are coded for easy ordering, as noted above. Please list valve number first; list fittings second, in continuous sequence; and list port third. Examples:

Part No.	Hamilton Valve
2MF1	#2 Two-Way Valve, with one Male and one Female Fitting, and #1 Two-Way Port, Total Cost \$16.00
3LLM3	#3 Three-Way Valve, with two Luer Lock and one Male Fitting, and #3 "T" Port, Total Cost \$27.00
4LLMM4	#4 Four-Way Valve, with two Luer Lock, two Male Fittings, and #4 Four-Way Port, Total Cost \$31.00

HOW TO ORDER

Because of the many options and accessories we may be confused over your order unless you give particular attention to the code letters that follow the model number. Your best guarantee of receiving the exact syringe you desire, and avoiding unnecessary delay, is to code your syringe order properly. The following explanation of the code will assist you in selecting the correct code letters:

CODE LETTER:	SYMBOL FOR:	DESIGNATES
N	Needle	A fixed (epoxy cemented) needle (see Page 4) of standard gauge, length and point style, as listed in schedule below.
SN	Special Needle	A fixed special needle that is different from the standard. Your specifications on gauge, length, and point style must accompany order.
LT	Luer Tip	A luer tip on the syringe for use with a needle that has an American Standard luer hub. Needles must be ordered separately.
LL	Luer Lock	A luer lock connector for use with a needle that has an American Standard luer hub. Needles must be ordered separately. (Not available on all syringes; check syringe description.)
CH	Chaney Adaptor	A Chaney Adaptor attachment (see Page 16).
W/G	With Guide	A Kel-F plunger guide attachment (see Page 4).
N/LT	Fixed Needle with Luer Tip	An "N" syringe with a luer tip.
GF	Gas Flush Modification	An attachment for Gas Tight Syringes that permits flushing of syringe. NOTE: GF goes before the model number.

You may want to combine two or more code letters to completely describe your requirements. If so, simply let the code letters follow each other as in the examples below:

EXAMPLES

701NW/G 701 syringe (10 μ l capacity), standard fixed needle, and a Kel-F plunger guide.

705SNCH 705 syringe (50 μ l capacity), fixed special needle (with gauge, length, and point style specified), and a Chaney Adaptor.

750LTCH 750 syringe (500 μ l capacity), luer tip (no needle), and a Chaney Adaptor.

STANDARD FIXED NEEDLES FOR SPECIFIC HAMILTON SYRINGES

Here are the needles that will be fixed (epoxy cemented) to the syringes when N is designated:

SYRINGE	GAUGE	O.D.	I.D.	TIP*
7001N†	25	.020	.006	.014
7005N†	25	.020	.013	—
7101N†	22	.028	.006	.014
701N	26	.0185	.0045	.015
HS7002N†	23	.025	.008	—
SS60†	—	.028	.020	.026
702N	2822	.029	.006	.014
705N	2822	.029	.006	.014
710N	2822	.029	.006	.014
725N	2822	.029	.006	.014

SYRINGE	GAUGE	O.D.	I.D.	TIP*
750N	2822	.029	.006	.014
1705N	2822	.029	.006	.014
1710N	2822	.029	.006	.014
1725N	2822	.029	.006	.014
1750N	2822	.029	.006	.014
1001N	2822	.029	.006	.014
1002N	2822	.029	.006	.014
1005N	2822	.029	.006	.014
1010N	2822	.029	.006	.014

*The last $\frac{3}{8}$ " of the needle is electrolytically tapered to this Outer Dimension.

†These needles are staked to the syringes, not epoxy cemented.

REPAIR CHARGES

700 SERIES

1. Plunger, fitted	\$ 6.00
2. Needle, installed (damaged needle must protrude 1/4 inch beyond glass)	6.00
3. Needle liner, installed (damaged or plugged liners)	3.00
4. Syringe for 701NCH and 702NCH, installed in customer's Chaney Adaptor (701N and 702N only)	18.00

7000 SERIES

1. Plunger, fitted	\$ 7.00
2. Plunger-needle assembly, replaced	9.50
3. Glass barrel, replaced if remainder is undamaged	12.50
4. New outer sleeve	6.00
5. New inner sleeve	6.00
6. 7101N replacement parts for field repair	
a. 17711 Needle	9.50
b. 17707 Teflon ferrule	.50
c. 15209 Plunger wire assembly	2.50
d. 14023 Hex thumb button	1.00

ALL TEFLON SYRINGE TF SERIES

1. Teflon Plunger tip, installed	\$ 6.00
2. Needle, installed (damaged needle must protrude 1/4 inch beyond syringe tip)	6.00
3. Needle Liner, installed (damaged or plugged liners)	3.00

CR 700 SYRINGE

1. Needle installed	\$ 1.00
2. New glass barrel	2.50
3. New plunger tip	5.00

1000 SERIES

1. Needle, installed (damaged needle must protrude 1/4 inch beyond glass)	\$ 6.00
2. Needle liner, installed (damaged or plugged liners)	3.00
3. Teflon tip, installed (1705 through 1001)	5.00
(1002 through 1010)	6.00
4. Barrel sold separately (not indexed)	5.00
5. Barrel fitted to customer's plunger and adjusted to index zero	6.00
6. Barrel ground for Chaney	7.00
7. Barrel with cemented needle	12.00
8. Barrel with cemented needle, ground for Chaney	13.00

0010, 0020, 0030

1. Glass barrel, fitted to undamaged, uncontaminated 0010 plunger	\$ 9.00
2. Glass barrel, fitted to undamaged, uncontaminated 0020 or 0030 plunger	6.00

HS 7002N HOT SYRINGE

1. Plunger, fitted	\$ 6.00
2. Plunger-needle assembly, replaced	12.00

SS 60 SOLID SAMPLER

1. Plunger, installed	\$ 3.00
2. Needle-assembly, installed	4.50

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SALES CONDITIONS

WARRANTY—All Hamilton products are warranted to be free of defects in material and workmanship. Any device failing due to such defects will be replaced without cost provided the device is returned and an explanation given. Please request a Returned Goods Authorization before returning products under warranty.

MODIFICATIONS—If modifications are required on any device to equip it for a special use, these will be done on a cost basis.

EXCHANGE—The Hamilton Company cannot exchange an item unless it has been in your laboratory less than 15 days, and is certified to be unused and in new condition.

DELIVERY—Delivery of equipment is F.O.B. customer's plant via Parcel Post in the United States and possessions. For this reason, special handling or extra mailing charges are charged to the customer. Devices broken in shipment are promptly replaced upon notification and return of the article.

QUANTITY DISCOUNTS—A 10% discount is allowed on quantities of 12 or more of any one item and size.

PRICES AND DISCOUNTS—All prices and quantity discounts given in the price list are subject to change without notice. Terms are: net 30 days.

PRICE LIST

MICROLITER SYRINGES

for removable needle.

Model Number	Item	Price Per Each
701-LT	10.0 µl capacity	\$12.00
702-LT	25.0 µl capacity	12.00
705-LT	50.0 µl capacity	12.00
710-LT	100.0 µl capacity	12.00
725-LT	250.0 µl capacity	12.00
750-LT	500.0 µl capacity	12.00
701-LTCH	10.0 µl capacity with Chaney Adaption	29.00
702-LTCH	25.0 µl capacity with Chaney Adaption	29.00
705-LTCH	50.0 µl capacity with Chaney Adaption	18.00
710-LTCH	100.0 µl capacity with Chaney Adaption	18.00
725-LTCH	250.0 µl capacity with Chaney Adaption	18.00
750-LTCH	500.0 µl capacity with Chaney Adaption	18.00

Luer Lock available on 725 and 750 only

MICROLITER SYRINGES

with fixed chromatograph type needles.

Model Number	Item	Price Per Each
7001-N	1.0 µl capacity with 7 cm needle	\$35.00
7005-N	5.0 µl capacity with 7 cm needle	35.00
7101-N	1.0 µl capacity with 7 cm needle	37.50
701-N	10.0 µl capacity with 2" fixed needle	18.00
702-N	25.0 µl capacity with 2" fixed needle	18.00
705-N	50.0 µl capacity with 2" fixed needle	18.00
710-N	100.0 µl capacity with 2" fixed needle	18.00
725-N	250.0 µl capacity with 2" fixed needle	18.00
750-N	500.0 µl capacity with 2" fixed needle	18.00
7001-NCH	7001-N w/Chaney Adaptor	41.00
7005-NCH	7005-N w/Chaney Adaptor	41.00
7101-NCH	7101 w/Chaney Adaptor	56.50
18800	Chaney Adaptor for 7101N	19.00
701-NCH	701N w/Chaney Adaption	35.00
702-NCH	702N w/Chaney Adaption	35.00
705-NCH	705N w/Chaney Adaption	24.00
710-NCH	710N w/Chaney Adaption	24.00
725-NCH	725N w/Chaney Adaption	24.00
750-NCH	750N w/Chaney Adaption	24.00
701-NW/G	701N w/plunger guide	25.00
W/G	Guide, may be ordered separately and installed by customer—State size and style of syringe	7.00

Platinum needle (refer to page 23)

If special needle desired, designate SN and specify size, length and style.

No extra charge under 1 foot nor in larger sizes than 34 gauge.

For glass luer tip with fixed needle, designate N/LT.

The 701 is available with 316 Stainless Steel plungers and needles or with Tungsten plungers.

GAS TIGHT SYRINGES

Teflon tipped syringe plunger.

Model Number	Item	Price Per Each
1705	0.05 ml capacity (50 µl)	\$19.00
1710	0.10 ml capacity (100 µl)	19.00
1725	0.25 ml capacity (250 µl)	19.00
1750	0.50 ml capacity (500 µl)	19.00
1001	1.00 ml capacity	19.00
1002	2.50 ml capacity	20.00
1005	5.00 ml capacity	20.00
1010	10.00 ml capacity	20.00
1020-LL	20 ml capacity	25.00
1030-LL	30 ml capacity	30.00
1050-LL	50 ml capacity	35.00
Available with fixed needle (N), specify size in gauge or inches, length, and style (see section on needles): Additional		6.00
Available with Chaney Adaptor (CH) Additional		6.00
The Luer Lock option is not available on the 1705 and 1710; 1020, 1030, 1050 available only with Luer Lock.		
GF	Gas Flush modification, additional	14.00

PIPET CONTROLS

(microsyringes).

Model Number	Item	Price Per Each
0010	1 ml capacity	\$18.50
0020	2 ml capacity	18.50
0030	5 ml capacity	18.50

CHANEY ADAPTORS

with interchangeable syringe.

Model Number	Item	Price Per Each
601-CH	With 1 cc long tuberculin syringe (non-interch.)	\$14.00
602-CH	With 2 cc interchangeable syringe	13.50
605-CH	With 5 cc interchangeable syringe	14.50
610-CH	With 10 cc interchangeable syringe	15.50
620-CH	With 20 cc syringe	16.50
	(specify glass or metal luer lock)	
630-CH	With 30 cc syringe	20.00
	(specify glass or metal luer lock)	
650-CH	With 50 cc non-interchangeable	30.00
	(specify glass or metal luer lock)	
699-CH	With 100 cc non-interchangeable syringe with glass tip	40.00

Available with fixed needle (NCH), specify size in gauge or inches, length, and style (see section on needles): additional 6.00

Specify syringe tip, whether all glass or metal luer lock

SYRINGE INNOVATIONS

Model Number	Item	Price Per Each
TF-1725	250 µl Teflon Syringe	\$50.00
TF-1750	500 µl Teflon Syringe	50.00
TF-1001	1 ml Teflon Syringe	50.00
TF-1002	2.5 ml Teflon Syringe	50.00
TF-1005	5 ml Teflon Syringe	50.00
TF-1010	10 ml Teflon Syringe	75.00
TF-1020	20 ml Teflon Syringe	75.00
HS-7002-N	2 µl capacity all-metal syringe	50.00
CR 700-20	1 to 20 µl adjustable capacity	75.00
CR 700-200	10 to 200 µl adjustable capacity	75.00
SS-60	Solid sampler, 0.28 OD electrocut needle .019 OD Plunger	20.00
PB 600-1	For use with 25 µl to 2.5 ml syringe	45.00
PB 600-10	For use with 5 ml to 10 ml syringe	45.00

Specify syringe size and type, and, needle size, length and point.

Illustration:

PB 600 (\$45.00) with 705 syringe (\$12.00) = \$57.00 total

PB 600 (\$45.00) with 705N syringe (\$18.00) = \$63.00 total

S 0500	Super Syringe, 0.5 liter capacity	\$90.00
S 1000	Super Syringe, 1.0 liter capacity	100.00
S 1500	Super Syringe, 1.5 liter capacity	100.00
87101	Head Space Sampler (capped bottle)	70.00
87102	Head Space Sampler (can)	70.00
87103	Head Space Sampler (corked bottle)	60.00
18614	Head attachment (capped bottle)	23.00
18619	Head attachment (can)	22.00
18609	Head attachment (corked bottle)	6.00
87001	Threaded Plunger Syringe, 0.50 ml capacity	29.00
87002	Threaded Plunger Syringe, 1.00 ml capacity	29.00
87003	Threaded Plunger Syringe, 2.50 ml capacity	29.00
87300	Back-Fill Syringe, 0.05 ml capacity	20.00
87301	Back-Fill Syringe, 0.10 ml capacity	20.00
87302	Back-Fill Syringe, 0.25 ml capacity	20.00
87303	Back-Fill Syringe, 0.50 ml capacity	20.00
87304	Back-Fill Syringe, 1.00 ml capacity	24.50
87305	Back-Fill Syringe, 2.50 ml capacity	24.50
87306	Back-Fill Syringe, 5.00 ml capacity	24.50
87307	Back-Fill Syringe, 10.00 ml capacity	24.50
87200	Syringe Mantle (for 1705, 1710, 1725, 1750)	29.00
87204	Syringe Mantle (for 1001)	29.00
87205	Syringe Mantle (for 1002)	29.00
87206	Syringe Mantle (for 1005)	29.00
87207	Syringe Mantle (for 1010)	29.00

PRICE LIST

NEEDLES, Hypodermic Type

American Standard Luer Short Hubs—Needle tubing 304 stainless steel full hard (Unsterilized) Stock 2" long—17 degree bent point.

Number		O.D.		I.D.		Price	
Std. Hub	Kel-F Hub	Gauge	Inches	M.M.	Inches	M.M.	Kel-F Std.
N-737		37	.003	0.076	.001	0.025	\$3.00
N-736		36	.004	0.10	.002	0.05	3.00
N-735		35	.005	0.13	.002	0.05	3.00
N-734		34	.007	0.18	.003	0.076	1.50
N-733		33	.008	0.20	.004	0.10	1.50
N-732		32	.009	0.23	.004	0.10	1.50
N-731	KF-731	31	.010	0.25	.005	0.13	\$2.00 1.50
N-730	KF-730	30	.012	0.30	.006	0.15	2.00 1.50
N-729	KF-729	29	.013	0.33	.007	0.18	2.00 1.50
N-728	KF-728	28	.014	0.36	.006	0.15	2.00 1.50
N-727	KF-727	27	.016	0.41	.008	0.20	2.00 1.50
N-726S	KF-726S	26	.0185	0.47	.0045	0.115	2.00 1.50
N-726	KF-726	26	.018	0.46	.010	0.25	2.00 1.50
N-725	KF-725	25	.020	0.51	.010	0.25	2.00 1.50
N-724	KF-724	24	.022	0.56	.012	0.30	2.00 1.50
N-723	KF-723	23	.025	0.64	.013	0.33	2.00 1.50
N-722	KF-722	22	.028	0.71	.016	0.41	2.00 1.50
N-722S	KF-722S	22	.028	0.71	.006	0.45	2.00 1.50
N-721	KF-721	21	.032	0.81	.020	0.51	2.00 1.50
N-720	KF-720	20	.035	0.89	.023	0.58	2.00 1.50
N-719	KF-719	19	.042	1.07	.027	0.69	2.00 1.50
N-718	KF-718	18	.049	1.24	.033	0.84	2.00 1.50
N-717	KF-717	17	.058	1.47	.042	1.07	2.00 1.50
N-716	KF-716	16	.065	1.65	.047	1.19	2.00 1.50
N-715	KF-715	15	.072	1.82	.054	1.37	2.00 1.50
N-714	KF-714	14	.083	2.10	.063	1.60	2.00 1.75
N-713	KF-713	13	.095	2.41	.071	1.80	2.00 1.75
N-712	KF-712	12	.109	2.76	.085	2.16	2.00 1.75
N-711	KF-711	11	.120	3.05	.094	2.38	2.00 1.75
N-710	KF-710	10	.134	3.40	.106	2.68	2.00 1.75

Specify point style and length.

Point Style: 1. 17 degree bent for septum penetration.
2. 22 degree bent for general use.
3. 90 degree bent (square end).
4. 12 degree standard for medical point.

Length: Two-inch needle will be supplied except when other lengths specified.
Add 50¢ per foot for needles over one foot long to eight feet.

Please specify if electrolytically tapered point is desired.

Special needles with or without hubs, quoted upon request.

Chromatograph Type Needles

American Standard Luer Short Hub. Stock 2" long, 17 degree bent point (style 1). (Shank 1 5/8", electrocut tip extends 3/8".)

Number	MAX. O.D.		MIN. O.D.		MIN. I.D.		PRICE	
	Inches	M.M.	Inches	M.M.	Inches	M.M.	KEL-F Hub	STD.
N-72822	.029	0.74	.014	0.36	.006	0.15	\$2.00	\$1.50
N-73025	.021	0.53	.012	0.31	.0058	0.15	2.00	1.50
N-73126	.0185	0.47	.012	0.31	.005	0.13	2.00	1.50
N-73529								
sheathed 35ga	—	29ga	—	.002	0.05	—	—	4.00
N-73731								
sheathed 37ga	—	31ga	—	.001	0.025	—	—	4.00

Platinum Needles

90% platinum, 10% ruthenium needle tubing, available in 18, 22, 26 and 27 gauges. May be used as cannula or fitted with Kel-F American Standard Luer Short Needle Hubs, or fixed to microliter syringes; write for quotation.

Teflon Needles

Teflon tubing with Kel-F hub. Leak tight for liquid or gas to 100 psi.

Number	Approx. Needle Gauge	O.D. (1)		I.D. (2)		List Per KF/TF 1 ft. long	Add Per Foot Additional
		Inches	M.M.	Inches	M.M.		
KF22TF	22	.029	0.74	.013	0.33	\$2.30	\$.30
KF21TF	21	.033	0.84	.015	0.38	2.30	.30
KF19STF	19S	.040	1.02	.020	0.51	2.30	.30
KF19LTF	19L	.043	1.09	.023	0.58	2.30	.30
KF18TF	18	.049	1.24	.029	0.74	2.30	.30
KF17TF	17	.056	1.42	.036	0.91	2.50	.50
KF16STF	16S	.064	1.62	.040	1.02	2.50	.50
KF16LTF	16L	.068	1.72	.044	1.12	2.50	.50
KF15TF	15	.074	1.88	.050	1.27	2.50	.50
KF14STF	14S	.082	2.08	.056	1.42	2.50	.50
KF14LTF	14L	.088	2.23	.062	1.57	2.80	.80
KF13TF	13	.096	2.44	.068	1.72	2.80	.80
KF12STF	12S	.106	2.68	.078	1.98	2.80	.80
KF12LTF	12L	.115	2.92	.085	2.16	2.80	.80
KF11LTF	11L	.126	3.20	.096	2.44	3.40	1.40
KF10LTF	10L	.139	3.53	.107	2.72	3.40	1.40
KF9LTF	9L	.153	3.88	.119	3.02	3.40	1.40
KF8LTF	8L	.171	4.34	.135	3.43	3.40	1.40

Tolerance (1) $\pm .004$ " (2) $\pm .010$ "

Symbols: S—Smaller, or, L—Larger than gage.

16801 Kel-F hub, syringe caps

.75

CHROMATOGRAPH ACCESSORIES

Model Number	Item	Price Per Each
870	Fraction collector (Complete with parts listed below and #875)	\$235.00
870-H	Fraction collector with heated line (same as above)	270.00
875	Vacuum probe with N-725-1/2" needle	5.00
880	Admission probe (mass spectrometer inlet system)	85.00
	Fraction collector parts:	
	Dewar Flask, each	10.00
	"U" tube, each (6 supplied with each Fraction Collector)	3.00
	Rubber stoppers, per 100	1.50
	Silica sand, per 3/4 pound	.50
840	Lecture Bottle Septum	30.00
86700	Injection Time Marker for 701N (Complete, but does not include syringe)	55.00
86702	Guide Switch Assembly for 701N	31.00
86701	Adaptor Unit	24.00
86705	Injection Time Marker for 700's and 7000's (Complete, but does not include syringe)	55.00
86706	Guide Switch Assembly for 700's and 7000's	31.00
86800	Inlet (Inlet price includes parts listed below)	95.00
	18217 Heater	6.50
	18228 Hamilton Septums (12)	3.60
	18220 Cap	2.25
	18219 Vaporizer Tube	1.50
	18221 Cap Remover	1.00
	18222 Mounting Bracket (2)	1.25
	18223 Input Fitting (Swagelok 200-1-or-316)	6.00
	NOTE: The Column Fitting for the Inlet must be ordered separately to specific column size; cost is in addition to the Inlet:	
	18224 1/16" Column fitting	20.00
	18225 1/8" Column fitting	15.00
	18226 3/16" Column fitting	14.00
	18227 1/4" Column fitting	11.00



1. Flanges are precisely formed on glass blanks.
2. Needle points are electro-lytically tapered to .014" O.D.
3. Needles are positioned prior to being epoxy cemented to the syringe.
4. The barrel is pre-honed in preparation to the final hand-lapping finish.



1.

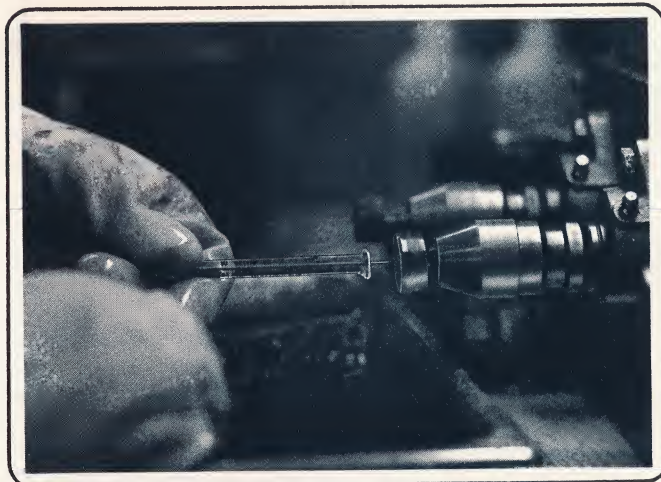
2.

4.

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Producing the best syringe we can possibly create is the best way we know to keep our friends and customers satisfied. You'll find no conventional production line at Hamilton... no cutting of corners... no sacrificing material quality to low bidding. We use only the finest materials we can obtain. We prepare them with exacting care. We assemble, fit and test every syringe by hand. Yes, we take every precaution—and do so with genuine enthusiasm. The result is the highest precision syringe available.

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All Hamilton products are warranted to be free of defects in material and workmanship. Any device failing due to such defects will be replaced without charge, provided the product is returned and an explanation given.

REPAIRS:

Our Customer Service Department can repair any damage to syringes, except glass damage. Repaired syringes are given a rigid quality test and are equal to new products in quality and performance before they are returned to the customer. Refer to Page 21 for schedule of costs.

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